

Appl. No. 10/784,904
Reply to Office action of October 13, 2005

REMARKS

This is intended as a full and complete response to the Office Action dated October 13, 2005, having a shortened statutory period for response set to expire on January 13, 2006. Please reconsider the claims pending in the application for reasons discussed below.

Claims 1-33 are pending in the application. Claims 1, 8, 9, 11, 29, and 30 have been amended. Claims 2, 3, 4, 10, 12, 13, 19, 20, 26, 29, and 33 have been cancelled. New claims 34-45 have been added.

A. Information Disclosure Statement

The Applicants thank the Examiner for reviewing and considering the references filed with Information Disclosure Statements dated: April 5, 2004; April 25, 2005; June 20, 2005; and July 25, 2005.

B. Claim Rejections – 35 USC § 102

Claims 1, 2, 9, 10, 25, 26 stand rejected under 35 U.S.C. § 102(e) as being anticipated by *Ishida et al.* (U.S. Patent No. 5,966,605). In response, Applicants have amended claims 1, 9, and 25 to more clearly recite aspects of the invention. The rejection is respectfully traversed.

Applicants submit that the claim 1 as currently amended is not anticipated or suggested by *Ishida*. *Ishida* teaches a method of eliminating poly depletion without negatively impacting shallow source/drain junctions. In *Ishida*, dopants are introduced into both the polysilicon gate and in the source /drain regions of the substrate. The polysilicon gate is then annealed with a laser anneal process (column 2, lines 6-11). *Ishida* teaches an annealing step in forming the source/drain region that is decoupled from the annealing of the doped poly gate to eliminate the trade-off between poly depletion and shallow source/drain regions (column 2, lines 54-60). However, *Ishida* is silent on a temperature range during a laser annealing process. Further, *Ishida* is silent on dopant concentrations in its processing technique in order to form a doped polycrystalline layer with a dopant concentration within a range 1×10^{19} atoms/cm³ to

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about 1×10^{21} atoms/cm³. Therefore, *Ishida* does not teach or suggest heating a doped polycrystalline layer to a temperature of about 1,050°C or greater during a laser anneal, nor does not teach or suggest implanting a polycrystalline layer with a dopant to form a doped polycrystalline layer containing a dopant concentration within a range from about 1×10^{19} atoms/cm³ to about 1×10^{21} atoms/cm³ as recited by claim 1. Accordingly, Applicants submit that claims 1, as well as claims 5-8 that depend thereon, are allowable and respectfully requests allowance of these claims.

Applicants submit that the claim 9 as currently amended is not anticipated or suggested by *Ishida*. *Ishida* is discussed above. *Ishida* is silent on a temperature range during a laser annealing process. Therefore, *Ishida* does not teach or suggest heating a doped polycrystalline layer to a temperature of about 1,050°C or greater during a laser anneal for about 500 milliseconds or less, as recited by claim 9. Accordingly, Applicants submit that claim 9 is allowable and respectfully requests allowance of this claim.

Applicants submit that the claim 25 as currently amended is not anticipated or suggested by *Ishida*. *Ishida* is discussed above. *Ishida* is silent on a temperature range during a laser annealing process and further, *Ishida* does not teach or suggest or show a dopant concentration within a range of 1×10^{19} atoms/cm³ to about 1×10^{21} atoms/cm³. Therefore, *Ishida* does not teach or suggest heating a doped polycrystalline layer to a temperature of about 1,050°C or greater during a laser anneal, nor does not teach or suggest implanting a polycrystalline layer with a dopant to form a doped polycrystalline layer containing a dopant concentration within a range from about 1×10^{19} atoms/cm³ to about 1×10^{21} atoms/cm³ as recited by claim 25. Further, *Ishida* does not teach or suggest heating a doped layer to a temperature of about 1,050°C or greater during a laser anneal to provide an electrical resistivity of about 400 ohms/cm² or less for a doped polycrystalline layer as recited by claim 25. Accordingly, Applicants submit that claim 25 is allowable and respectfully requests allowance of this claim.

Applicants have cancelled claims 2, 10, and 26 without prejudice obviating these rejections.

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C. Claim Rejections – 35 USC § 103

Claims 3-8 are rejected under 35 USC § 103(a) as being upatentable over *Ishida* in view of *Wolf* (*Silicon Processing for VLSI Era by S. Wolf V.I.*). The teachings of *Ishida* have been discussed above. *Wolf* does not obviate the deficiencies of *Ishida*. *Wolf* discloses diffusion in polycrystalline silicon and its differences with respect to single crystal material (*Wolf*, page 261, paragraph 3). In addition, *Wolf* discloses diffusion coefficients in poly silicon films such as phosphorus, boron, and arsenic diffusivities in poly-Silicon ranging from 800°C to 1000°C. Further, *Wolf* teaches diffusion processes that are conducted in systems known as diffusion furnaces, which provide controlled high temperature and gas flow conditions with a typical diffusion system consists of a heating element, diffusion tube, boat and dopant delivery system (page 264, paragraph 3). The diffusion report disclosed in *Wolf* is limited to temperatures that are between 800°C to 1000°C (Table 3, page 261). Therefore, *Wolf* teaches away from temperatures that exceed 1000°C during an annealing process. Further, *Wolf's* teachings on diffusion systems are limited to diffusion furnaces and it does not disclose a laser annealing process. Thus, combination of *Ishida* and *Wolf* does not teach, show or suggest implanting the polycrystalline layer with a dopant to form a doped polycrystalline layer containing a dopant concentration within a range from about 1×10^{19} atoms/cm³ to about 1×10^{21} atoms/cm³, exposing the doped polycrystalline layer to a rapid thermal anneal and heating the doped polycrystalline layer to a temperature of about 1,050°C or greater during a laser anneal as recited by amended claim 1, which claims 5-8 depend from. Therefore, Applicants submit that dependent claims 5-8 are patentable over *Ishida* in view of *Wolf*.

Claims 11-17 are rejected under 35 USC § 103(a) as being upatentable over *Ishida* in view of *Wolf*. The teachings of *Ishida* and *Wolf* have been discussed above. *Wolf* does not obviate the deficiencies of *Ishida*. As discussed above, the diffusion report disclosed in *Wolf* is limited to temperatures that are between 800°C to about 1000°C (table 3, page 261). Therefore, *Wolf* teaches away from temperatures that exceed 1000°C during an annealing process. Further, *Wolf's* teachings on diffusion systems are limited to diffusion furnaces and it does not disclose a laser annealing

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process. Thus, combination of *Ishida* and *Wolf* does not teach, show or suggest heating the doped polycrystalline layer to a temperature of about 1,050°C or greater during a laser anneal for about 500 milliseconds or less as recited by amended claim 9, which claims 11, 14-17 depend from. Therefore, Applicants submit that dependent claims 9, 11, 14-17 are patentable over *Ishida* in view of *Wolf*.

Claims 27-33 are rejected under 35 USC § 103(a) as being unpatentable over *Ishida* in view of *Wolf*. The teachings of *Ishida* and *Wolf* have been discussed above. As discussed above, *Wolf* does not obviate the deficiencies of *Ishida*. *Wolf* teaches away from temperatures that exceed 1000°C during a laser annealing process. Further, *Wolf's* teachings on diffusion systems are limited to diffusion furnaces and it does not disclose a laser annealing process. Thus, combination of *Ishida* and *Wolf* does not teach, show or depositing a doped polycrystalline layer on a substrate, wherein the doped polycrystalline layer has a dopant concentration within a range from about 1×10^{19} atoms/cm³ to about 1×10^{21} atoms/cm³, exposing the doped polycrystalline layer to a rapid thermal anneal, and heating the doped polycrystalline layer to a temperature of about 1,050°C or greater during a laser anneal to provide an electrical resistivity of about 400 ohms/cm² or less for the doped polycrystalline layer as recited by amended claim 25, which claims 27, 30-32 depend from. Therefore, Applicants submit that dependent claims 27, 30-32 are patentable over *Ishida* in view of *Wolf*.

Claims 18, 19, and 21-24 are rejected under 35 USC § 103(a) as being unpatentable over *Ishida*. In response, Applicants have amended claims 18, and 21-24 to more clearly recite aspects of the invention. Claims 18, and 21-24 as amended recite limitations not taught, shown or suggested by *Ishida*. The teaching of *Ishida* has been discussed above. As discussed, *Ishida* is silent on a temperature range during a laser annealing process. In addition, *Ishida* does not disclose boron as a doping element. Thus, *Ishida* does not teach, show or suggest doping the polycrystalline layer with boron to form a doped polycrystalline layer, exposing the doped polycrystalline layer to a rapid thermal anneal at a first temperature, and exposing the doped polycrystalline layer to a laser anneal at a second temperature of about 1,050°C or higher for about 500

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milliseconds or less, as recited by claim 18. Therefore, Applicants submit that claim 18, and dependent claims 21-24 are patentable over *Ishida*.

Applicants have cancelled claims 3, 4, 12, 13, 19, 20, 29, and 33 without prejudice obviating these rejections.

NEW CLAIMS

Applicants have added new claims 34-45 to claim additional aspects of the invention. Applicants believe that no new matter has been entered. Applicants respectfully request allowance of new claims 34-45.

Having addressed all issues set out in the office action, Applicants respectfully submit that the claims are in condition for allowance and respectfully request that the claims be allowed.

Respectfully submitted,


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